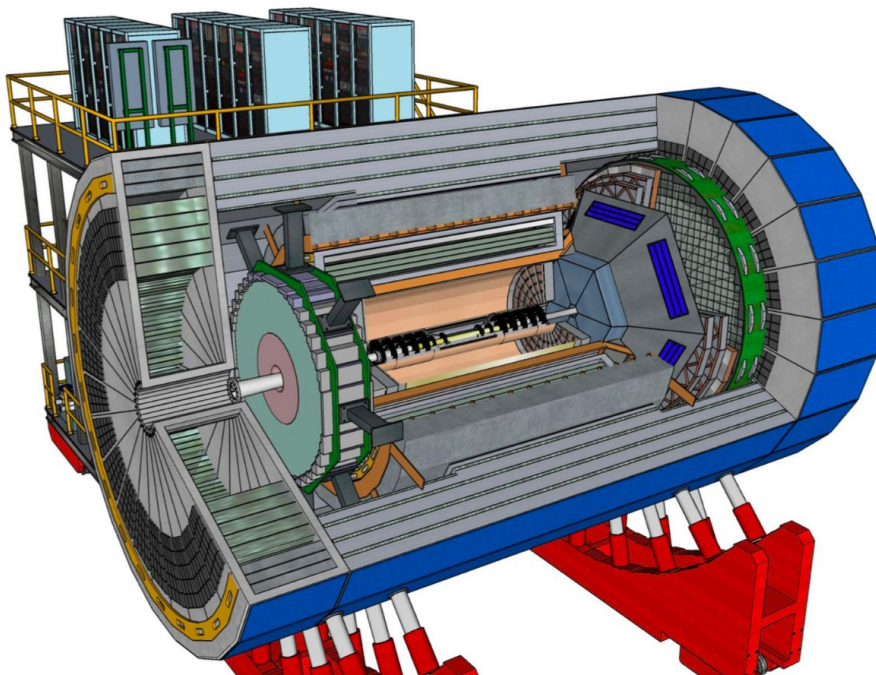


Detector Working Group Progress



- DWGs continuing evaluation of leading technology alternatives. *Join us!*
- Detector Team Group Meeting scheduled for 11 am to 2 pm EDT on June 10.
 - co-convener from each DWG will present latest status of evaluated technology options, and optimal re-use where appropriate
 - <https://indico.bnl.gov/event/12079/>
- June 14th is our internal goal for ECCE detector baseline configuration (with very limited list of appropriate alternatives and upgrade options)
- Options under consideration remain a refinement of the ECCE concept (with its recognized leading detector options) shown on next slides.
- Leading detector options have been reviewed with Jin and Cameron. On track for full simulations, though complicated detector geometries may be simplified initially (e.g. dRICH).

ECCE General Detector Concept



ECCE ELECTRON ENDCAP STRAWMAN

Tracking: MAPS, Micro Pattern Gaseous Detectors (MPGD)

Electron Detection: PWO&SciGlass

- Inner part: PWO crystals (reuse some)
- Outer part: SciGlass (backup PbGl)

h-PID: mRICH

- From yellow report

HCAL: Steel from magnet or Pb/Sc or Fe/Sc

- Not instrumented and only serve as flux return?
- Instrumented \w reduced thickness (lower energies)

ECCE CENTRAL BARREL STRAWMAN

Tracking: Silicon barrel tracker (optional Si/GEM hybrid)

Electron PID: SciGlass (backup: W/Sc (Pb/Sc) shashlik)

- SciGlass remains to be demonstrated
- Several backup options – lower resolution though

h-PID: hpDIRC & AC-LGAD

- Compact
- AC-LGAD never been shown for barrel configuration
- AC-LGAD backup: dE/dx (needs more space)

HCAL: magnet steel (**reuse**) - Fe/Sc

ECCE HADRON ENDCAP STRAWMAN

Tracking: MAPS, Micro Pattern Gaseous Detectors (MPGD)

h-PID: dRICH&TOF

e/h separation: TOF & aerogel

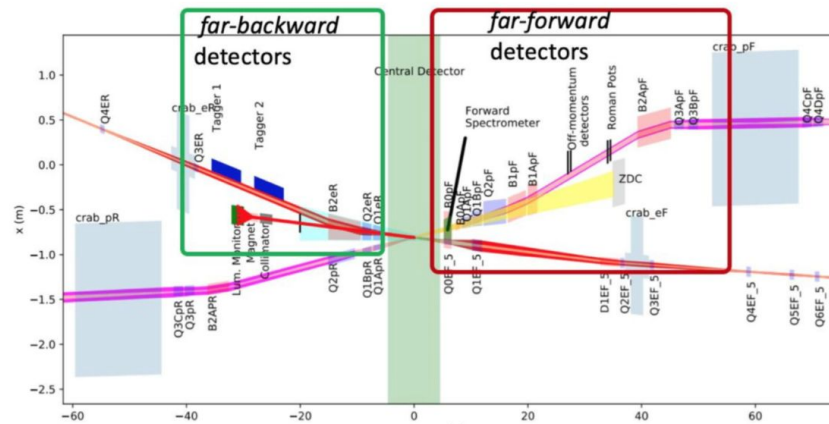
- TRD to separate electrons from high momentum hadrons?

Electron PID: W/ScFi, Pb/Sc or W/Sc shashlik

HCAL: Pb/Sc or Fe/Sc

- Alternative for improved resolution: dual readout, high-granularity

ECCE General Detector Concept



Detector Technologies (from YR)

FAR BACKWARD DETECTORS

- low-Q2 tagger
 - Lumi-detector
- Lepton polarimetry
hadron polarimetry

FAR FORWARD DETECTORS

- ZDC – Si/W & PWO (SciGlass)
 - Roman Pots – Silicon sensors, AC-LGADs
 - Off-momentum det. – Silicon sensors
 - B0-trackers – MAPS & timing layers
- Lepton polarimetry
hadron polarimetry

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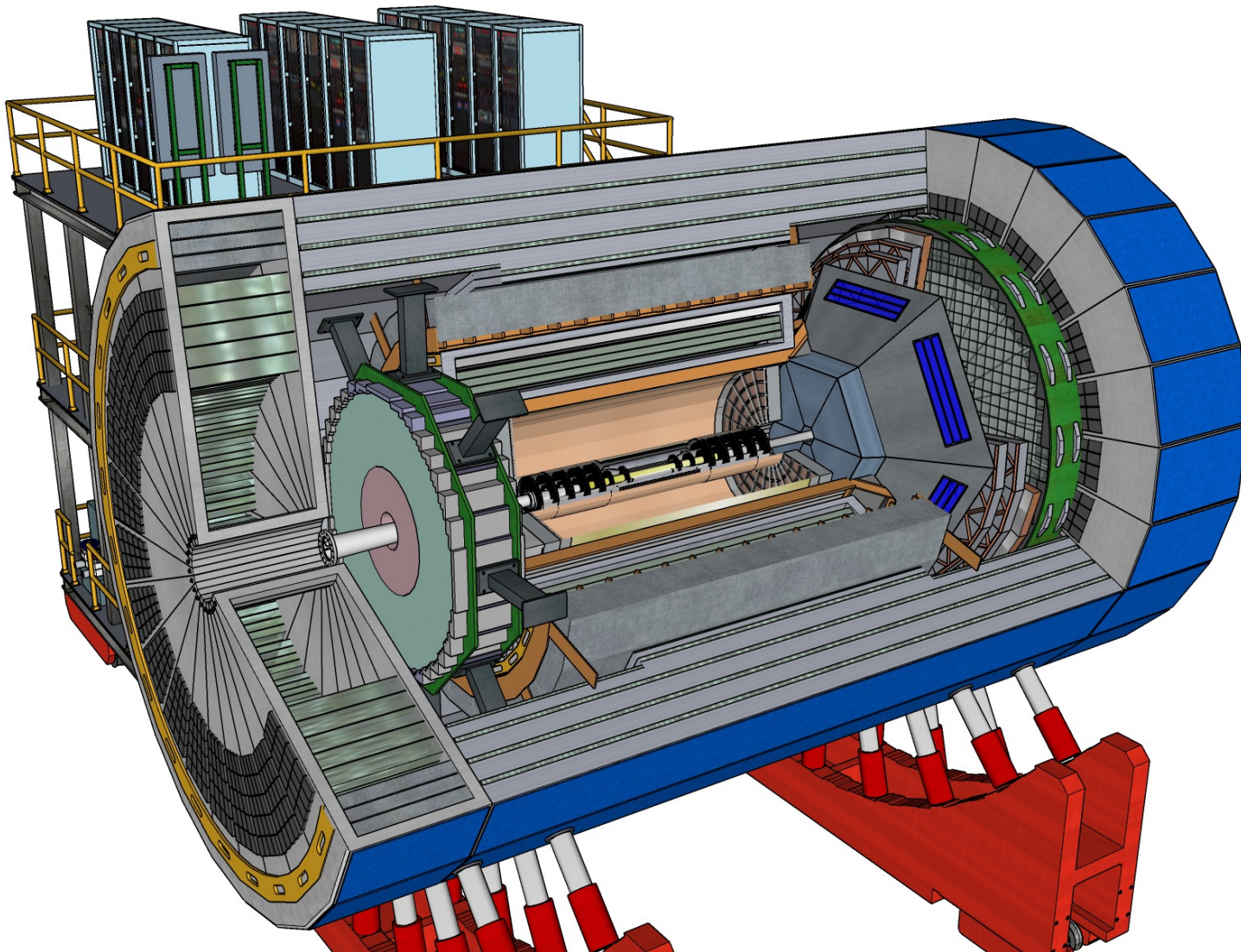
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Electron PID: W/ScFi, Pb/Sc or W/Sc shashlik

HCAL: Pb/Sc or Fe/Sc

- Alternative for improved resolution: dual readout, high-granularity

ECCE Detector



Red = preferred technology
Blue = preferred technology
 \w some open questions
Black = still being discussed

ELECTRON ENDCAP

Tracking: GEM / MPGD

Electron Detection:

- Inner part: PWO crystals (reuse some)
- Outer part: SciGlass (backup PbGl)

h-PID: mRICH

HCAL: Steel from magnet or Fe/Sc

- Not instrumented and only serve as flux return?
- Instrumented \w reduced thickness (lower energies)

CENTRAL BARREL

Tracking: Silicon barrel + forward tracker (optional Si/GEM hybrid)

Electron PID: SciGlass (backup: PbGl or W(Pb)/Sc shashlik)

h-PID: hpDIRC & AC-LGAD [progress: DIRC orientation ☺]

HCAL: magnet steel (reuse) - Fe/Sc

HADRON ENDCAP

Tracking: GEM / MPGD

PID: dual-RICH & AC-LGAD

Calorimetry: standard W/ScFi + Fe/Sc

Upgrade: Dual Readout EM+Had Cal?

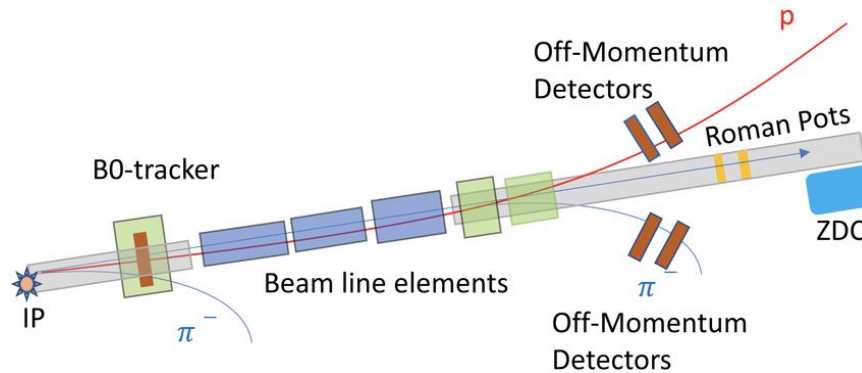
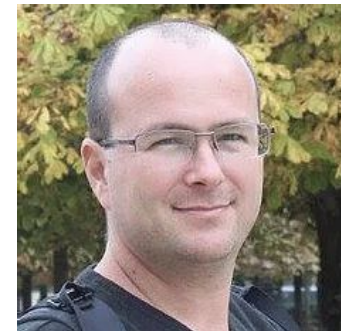
Example discussions:

- Backup for AC-LGAD in barrel
- SciGlass ongoing R&D timeline
- Hadron Endcap calorimetry

Far Forward/Back Team Fully Assembled



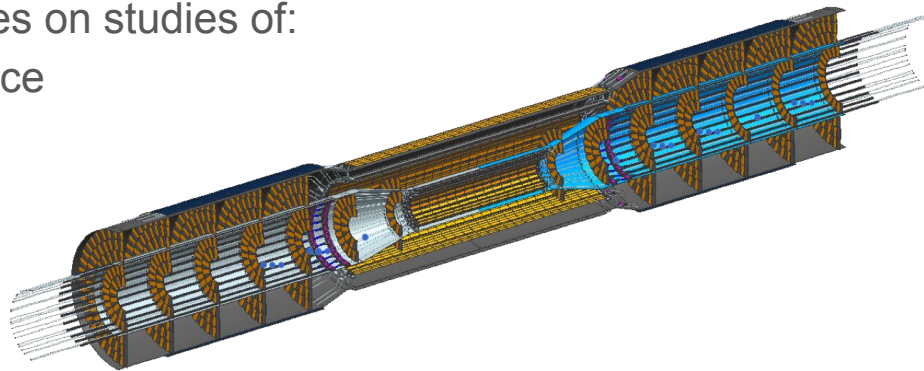
- Igor Korover (MIT) and Yuji Goto (RIKEN) have joined Michael Murray (KU) as co-conveners of the Far Forward/ Far Backward DWG.
- This teams detectors include:
 - Backward Electron Small Angle (low Q²) Tagging
 - Forward B0 Detector (detector inside the B0 magnet along with beam pipes)
 - Off-Momentum Detectors
 - Roman Pots
 - Zero Degree Calorimeter (ZDC)
- Duquesne rising senior Asia Parker was awarded a JSA fellowship to work on far forward detectors (primarily ZDC) and physics over the coming year.
- AI for final fine tuning of locations and detector types looks very promising especially for the ZDC and perhaps for IP8 Roman Pot locations.



Recent Tracking DWG Progress



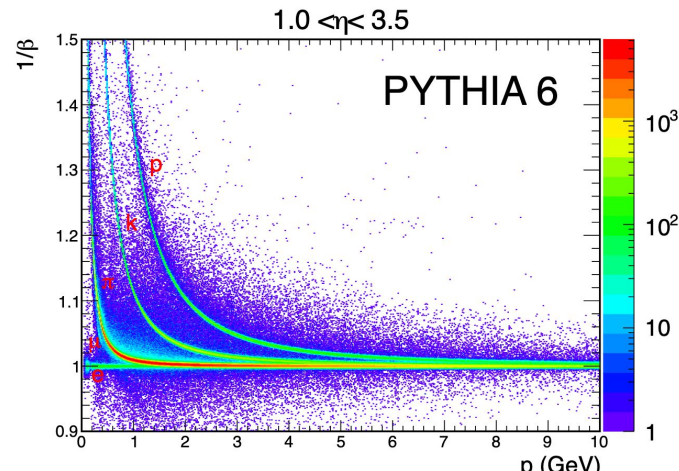
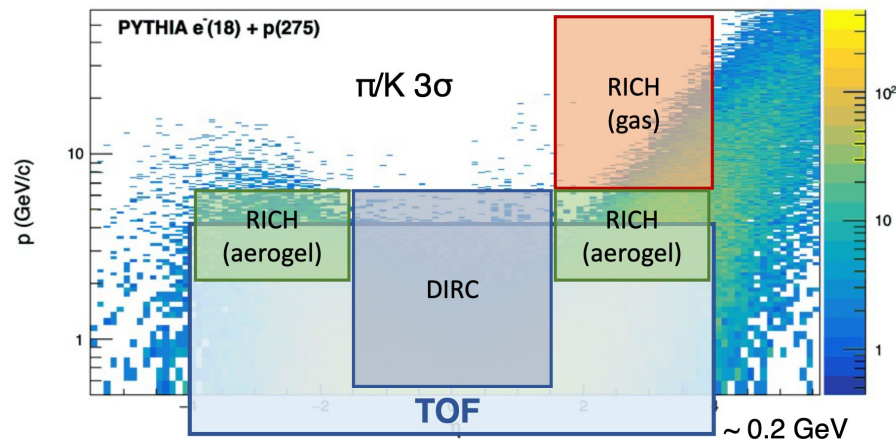
- Tracking DWG has recently presented updates on studies of:
 - **MAPS Silicon tracker** barrel performance
 - **Forward silicon tracker** performance
 - **μ RWell (MPDG)** end-cap tracking
 - Further recent details here:
 - <https://indico.bnl.gov/event/11654/>
 - <https://indico.bnl.gov/event/11659/>
- Details of how the central tracker can be built (drawing in Siemens NX)
 - Likely will need to clam shell around the beamline (alternatives being investigated)
 - Details like the cooling lines and cables shown & add to the material budget.
- Promising optimization of silicon tracker recently reported by ECCE AI team here:
<https://indico.bnl.gov/event/12052/>



Recent PID DWG Progress



- PID DWG has recently presented updates on progress towards Fun4All performance studies:
 - **LGAD** TOF available for evaluation in Fun4All
 - Progress implementing **dRICH** and **hpDIRC** in Fun4All
 - Optimizing **mRICH** in Fun4All
- Recognize need to properly pass PID info within Fun4All
- Visualization of ECCE PID concept from talk with Wei Li (Rice)
- PID from TOF using LGAD detectors (shown with electron, muon, pion, kaon, & proton).

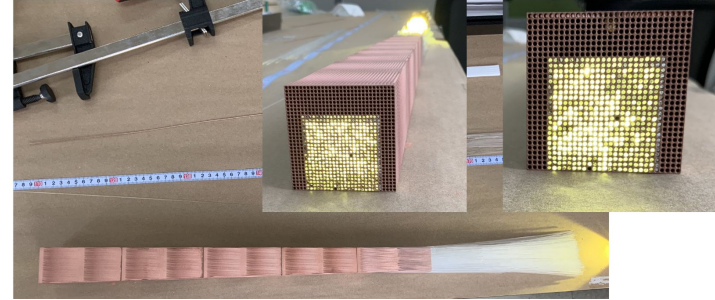


Recent Calorimetry DWG Progress



- Calorimetry DWG has recently presented updates on emerging primary options:
 - Insert Dual Readout with 3D printing for forward calorimetry, surrounded by standard ECAL and longitudinally-segmented HCAL
 - Re-use for Backward HCAL and Barrel HCAL
 - SciGlass for Barrel ECAL
 - Hybrid SciGlass/PbWO for Backward ECAL
 - Further details available here:

- <https://indico.bnl.gov/event/11915/>
- <https://indico.bnl.gov/event/11917/>



Example 3D printed Dual Readout Calorimeter

- Working on arranging mechanical engineering help at ORNL for some aspects.
- First discussions toward capturing Calorimetry risks and costs in early draft of Risk Log and Oracle P6 WBS.

DWG Communication Tools

- Be sure to subscribe to ecce-eic-det-l@lists.bnl.gov
- All DWG meetings listed here:
 - <https://indico.bnl.gov/category/339/calendar>
 - <https://indico.bnl.gov/category/345/>
- Detector Wiki pages:
https://wiki.bnl.gov/eicug/index.php/ECCE_Detector
- BNL Mattermost Fun4All-<subsystem> and Discourse ECCE channels.

BACKUP